

REMARKS

This amendment responds to the Office Action mailed on February 7, 2006. Claims 17-26 are currently pending, of which claims 17, 20 and 21 have been amended. In view of the foregoing amendments, as well as the following remarks, Applicants respectfully submit that this application is in complete condition for allowance and request reconsideration of the application in this regard.

The present invention generally makes it possible to dispense a precise amount of liquid efficiently and without precipitating solid particles. This may be achieved by directing a liquid containing solid particles back and forth through a flow passage connected to two vessels, such as syringes, and dispensing the liquid from a valve while that liquid is flowing between those vessels. Reference to FIG. 1 and the corresponding description will assist in understanding one exemplary embodiment of the invention.

The liquid dispensing apparatus 1 includes a flow passage that connects two or more vessels, represented by the first syringe 5-1 and the second syringe 5-2, that are filled with a liquid 6. The flow passage, represented by a first pipe 10-1 and a second pipe 10-2 in the embodiment of FIG. 1, communicates the two syringes 5-1 and 5-2 with each other so that liquid 6 may flow between the syringes 5-1, 5-2. A first pressurizing device, represented by a first three-way solenoid valve 13-1 and a first regulator with relief 14-1, and a second pressurizing device, represented by a second three-way solenoid valve 13-2 and a second regulator with relief 14-2, alters the pressure in the interior of the syringes 5-1, 5-2.

The first and second pressurizing devices alter the pressures inside of the syringes 5-1, 5-2 back and forth to cause the fluid 6 to flow from one syringe 5-1, 5-2 to

the other and vice versa. In this way, a continuous flow is maintained between the syringes 5-1, 5-2. Flowing the liquid 6 containing the solid particles back and forth between the syringes 5-1, 5-2 allows liquid to be dispensed out of the valve, represented by the nozzle 3, through a space created between nozzle 3 and the valve seat 4 in very precise amounts without precipitation of solid particles.

In addition, inside of the flow passageway a flow rate restricting member represented by a first orifice 8-1 and a second orifice 8-2 additionally regulates the rate of the flow of the liquid 6 between the syringes 5-1, 5-2. Accordingly, controlling the pressure inside of the syringes 5-1, 5-2 using the first and second pressurizing devices and using backpressure created by the orifices 8-1, 8-2 controls the final rate of dispensing of the liquid 6 out of the nozzle 3.

A. Rejection of Claims under 35 U.S.C. §§ 102(b) and 102(e).

The Examiner rejected claims 17-23 and 25-26 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,435,462 to Fujii (hereinafter the “Fujii reference”). Claim 17 recites “a flow passage adapted to enable the liquid to communicate between said two or more vessels.” The Fujii reference fails to disclose or suggest this feature. The liquid does not flow between the cartridges 28 and 28a, alleged by the Examiner to represent two or more vessels in the Fujii reference, as required by the language of independent claim 17. In fact, the Fujii reference teaches away from the flow occurring between the cartridges 28 and 28a because the valves 44 and 44a are one-way valves. One-way valves make it impossible for liquid to flow from one cartridge 28 to the other cartridge 28a. Accordingly, Applicants request that the rejection of claim 17 be withdrawn.

In addition, claim 17 recites “a flow rate of the liquid flowing between said two or more vessels in said flow passage when said first pressurizing device applies the predetermined pressure to said at least one vessel of said two or more vessels and the second pressurizing device sets the pressure of said at least one remaining vessel at the lower level than the predetermined pressure of said at least one vessel.” The Fujii reference fails to disclose or suggest these features anywhere. As already discussed, there is no fluid communication between the cartridges 28, 28a, alleged by the Examiner to be the two or more vessels, much less disclosure or suggestion for altering the pressures inside of the cartridges 28, 28a. Therefore, Applicants request that the rejection of claim 17 be withdrawn for this additional reason.

Claims 18-23 and 25-26 all depend from independent claim 17. It is therefore respectfully submitted that claims 18-23 and 25-26 are allowable over the references of record for at least the reasons provided with respect to independent claim 17.

The Examiner also rejected claims 17-23 and 26 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,540,104 to Yanagita et al. (hereinafter the “Yanagita reference”). As previously noted, claim 17 recites “a flow rate of the liquid flowing between said two or more vessels in said flow passage when said first pressurizing device applies the predetermined pressure to said at least one vessel of said two or more vessels and the second pressurizing device sets the pressure of said at least one remaining vessel at the lower level than the predetermined pressure of said at least one vessel.” The Examiner alleges that the cylinders 34a and 34b in the Yanagita reference disclose the vessels recited in claim 17. However, there is no flow between the cylinders 34a and 34b, much less disclosure of altering pressure between

the vessels to create such a flow.

The Yanagita reference operates by taking in material 16 through an inlet valve 60a or 60b and then closing that inlet valve 60a or 60b once a sufficient amount of material has been introduced into the cylinders 34a or 34b. The cylinders 34a and 34b are then pressurized. An outlet valve 62a or 62b may then be opened causing fluid to flow out of dispensing outlet 26. There is a transitional period when one of the cylinders 34a or 34b is being filled and the other cylinder 34a or 34b is nearing empty. During this time, the device disclosed in the Yanagita reference takes steps to make the flow from the dispensing outlet 26 as smooth as possible. However, the Yanagita reference fails to disclose that the material 16 flows between the cylinders 34a and 34b through the material supply line 58. Moreover, there is no disclosure in the Yanagita reference that a pressure difference should be created between the cylinders 34a, 34b in order to drive such a flow.

In fact, if such a pressure difference was created and the material 16 could flow between cylinders 34a and 34b in the Yanagita reference, it would render the device inoperable for its intended purpose. As disclosed in col. 4, lines 28-31 of the Yanagita reference, the general purpose of the device is to prevent downtime in production. The switching between cylinders 34a and 34b ensures that a constant fluid flow exits the dispensing outlet 26. During the transitional flow period, the material 16 in cylinder 34a is flowing through line 56 when valve 62a is opened. As levels of material 16 become close to the bottom of the cylinder 34a, the valve 62b is opened causing flow to begin from cylinder 34b and pressure is reduced in cylinder 34a. During this time, however, fluid still flows from cylinder 34a to meet up with the fluid from cylinder 34b. Eventually, the combination of flows is dispensed through the outlet 26. If the fluid

from cylinder 34b were to flow back toward cylinder 34a, the device would be rendered inoperable because of opposing fluid flows. Fluid would still be exiting cylinder 34a towards opening 26 and the fluid from 34b towards 34a would oppose such a flow. Accordingly, the Yanagita reference teaches away from the language of claim 17.

For at least these reasons, Applicants request that the rejection of claim 17 be withdrawn.

Claims 18-23 and 26 all depend from independent claim 17 and therefore include all the features of independent claim 17. It is therefore respectfully submitted that independent claims 18-23 and 26 are allowable over the references of record for the same reasons as independent claim 17.

B. Claim Rejections under 35 U.S.C. § 103(a).

The Examiner rejected claim 24 as being unpatentable over the combination of the Fujii reference or the Yaganita reference with U.S. Patent No. 4,911,956 to Gabryszewski (hereinafter the “Gabryszewski reference”). Claim 24 is patentable for at least the same reasons as independent claim 17. Furthermore, claim 24 recites a unique combination of elements not disclosed or suggested by the combination of the Fujii, Yaganita, and Gabryszewski references.

C. Conclusion

Applicants have made a bona fide effort to respond to each and every requirement set forth in the Office Action. In view of the foregoing amendment and remarks, this application is submitted to be in complete condition for allowance and, accordingly, a notice to this effect is earnestly solicited. In the event that any issues

remain outstanding, the Examiner is invited to contact the undersigned to expedite issuance of this application.

Applicants do not believe that any fees are due in connection with this response other than the one month extension fee. However, if any additional fees are necessary as a result of this communication, the Commissioner is hereby authorized to charge any necessary fees to Deposit Account 23-3000.

Respectfully submitted,

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